Service manual

Ver. 1.0

KEMPOMIG 3200

KEMPOMIG 4000W

KEMPOMIG 3200W

KEMPOMIG 4000

KEMPOMIG FEED 400

KEMPPI The Joy of Welding

Contents

General…….3

Technical data……...……...3

Switches and connectors…….……4, 5

Operation principle……...……..5

IGBT-module control……...……. 6, 7

Voltage after secondary diodes……..……..... 8, 9

Troubleshooting/diagram……...……...10-12

Wire feeder´s error codes…….……12

Signals between power source and wire feeder……...13-15

Solenoid valve control…….……16

Wire feed motor control.…….……...16

Torch connection…….……...…….17, 18

Signals from Wf-unit´s connectors…...…….19

Cooling unit control…….……...20

Adjusting the cooling unit pressure watch limit…….....20

Power source control card A001 layout..…...……..21

Wire feed unit control card A001 layout……..21

MSD 1-meter unit layout..……...……...22

Notes……...……..23

General

Kempomig-power sources are MIG/MAG and MMA –power sources designed for professional use.

Kempomig-power sources are inverter power sources based on IGBTs controlled by PWM principle. The operating frequency is fixed on 18 kHz throughout the machine´s operating range.

Kempomig-power source together with Feed-unit form a compilation, in which the Feed-unit controls all the operations. Feed-unit´s all functions are programmatically controlled.

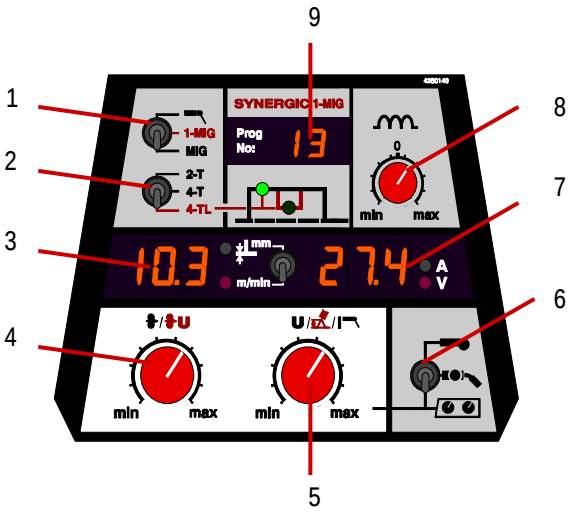
Technical data

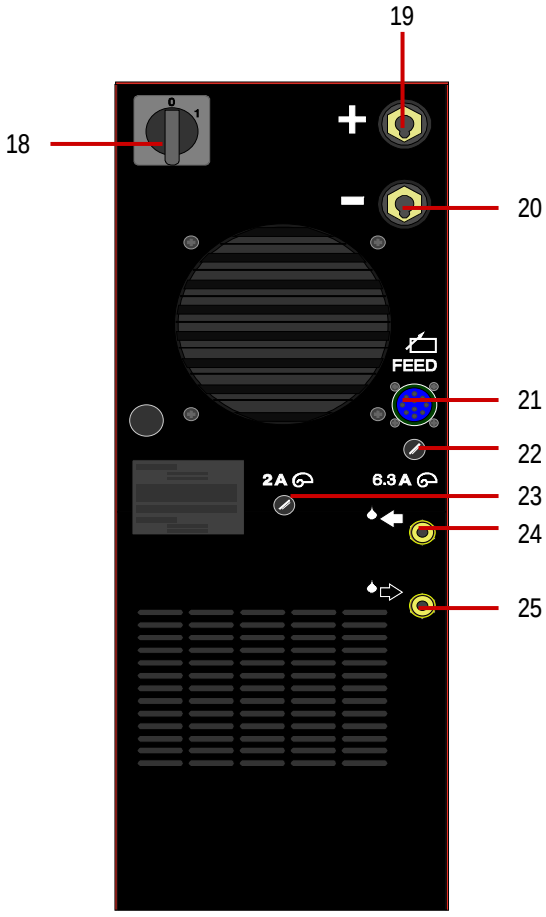
	3200	4000
Supply voltage	3~ 50 / 60 Hz 400 V +10....-15 %	3~ 50 / 60 Hz 400 V +10....-15 %
Connection power	13,4 kVA / 320 A (50 % ED)	18,4 kVA / 400 A (40 % ED)
Supply cable/fuses	4 x 2,5 S / 16 A slow	4 x 2,5 S / 16 A slow
Loadability	320 A / 32,8 V (50 % ED) 250 A / 30,0 V (100% ED)	400 A / 36,0 V (40 % ED) 250 A / 30,0 V (100% ED)
Welding current adj. range	10 A – 320 A (MMA)	10 A – 400 A (MMA)
Welding voltage adj. range	10 V – 35 V (MIG)	10 V – 40 V (MIG)
Max. welding voltage	40 V / 320 A (MMA)	40 V / 400 A (MMA)
OCV	approx. 75 V	approx. 75 V
Idling power	< 55 W	< 55 W
Degree of protection	IP 23C	IP 23C
Measures		
Length	940 mm	940 mm
Width	515 mm	515 mm
Height	880 mm	880 mm

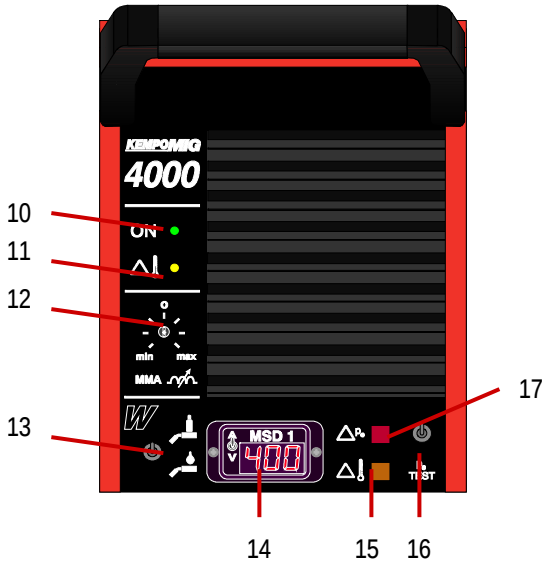
	3200W/4000W
Water tank volume	3 l
Cooling power	620 W
Max. pressure	400 kPa
Max. flow	4 l / min.

	FEED 400
Supply voltage	30 Vac 50/60 Hz (150 VA)
Loadability	
60% ED	400 A
100% ED	310 A
Wf-speed	0,5...18/25 m/min
Wire spool (max)	20 kg (ϕ 300 mm)
Weight	15 kg
Measures	
Length	570 mm
Width	210 mm
Height	440 mm

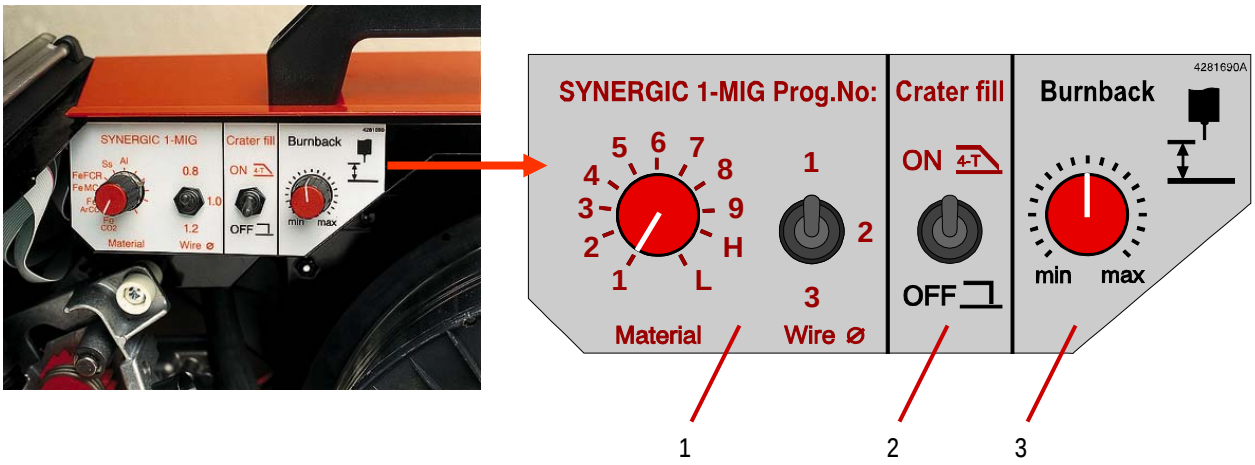
Switches and connectors







1 Process selection
2 Local / remote control selection
3 Wire feed speed-/ plate thickness display
4 Wire feed speed -/ power adjustment
5 Voltage -/arc length -/ current setting
6 Local / remote control
7 Voltage -/ current set value display
8 Dynamis adjustment, MIG/MAG
9 Synergic program number
10 On/off-signal lamp
11 Overheat signal lamp
12 Dynamics adjustment, MMA
13 Cooling method selection
14 MSD 1-meter unit
15 Coolant overheat signal lamp
16 Cooling unit test switch
17 Missing pressure signal lamp
18 Main switch S001
19 Welding current connection
20 Welding current connection
21 Control connection (amphenol 10-pin)
22 Control connection fuse 6,3 A, slow
23 Cooling unit fuse 2 A, slow
24 Coolant connector, pressure
25 Coolant connector, return

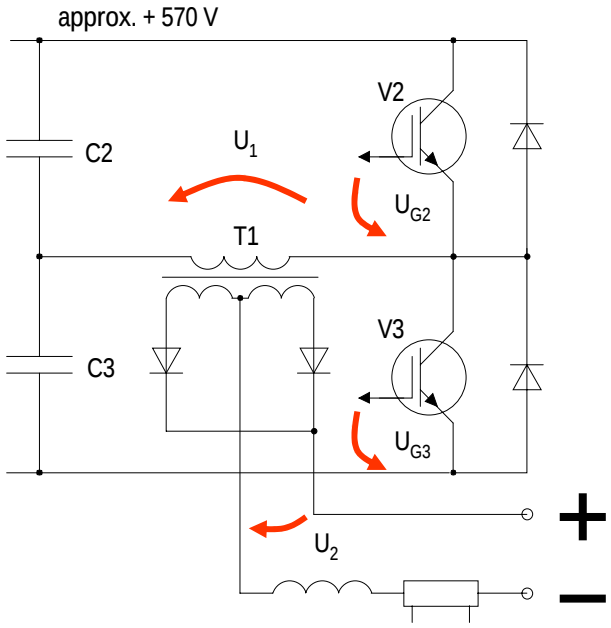


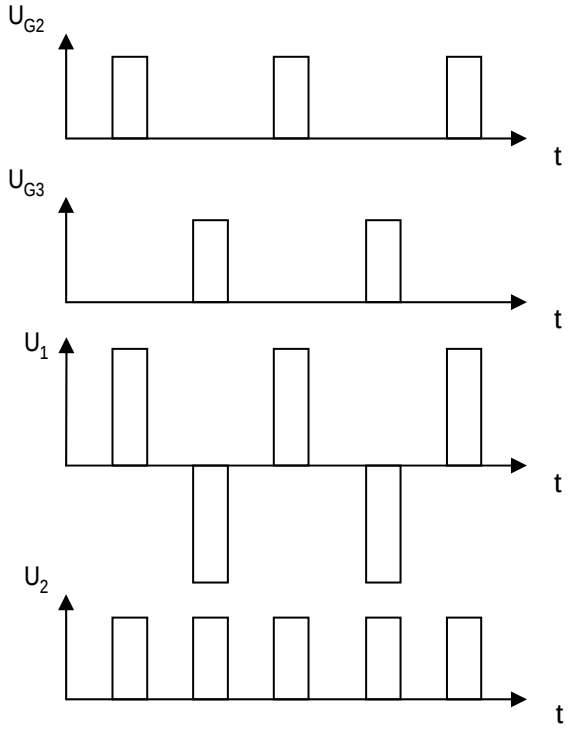
1 Synergic program selection
2 Crater fill on/off
3 Post current adjustment 40 ms...760 ms

Operation principle

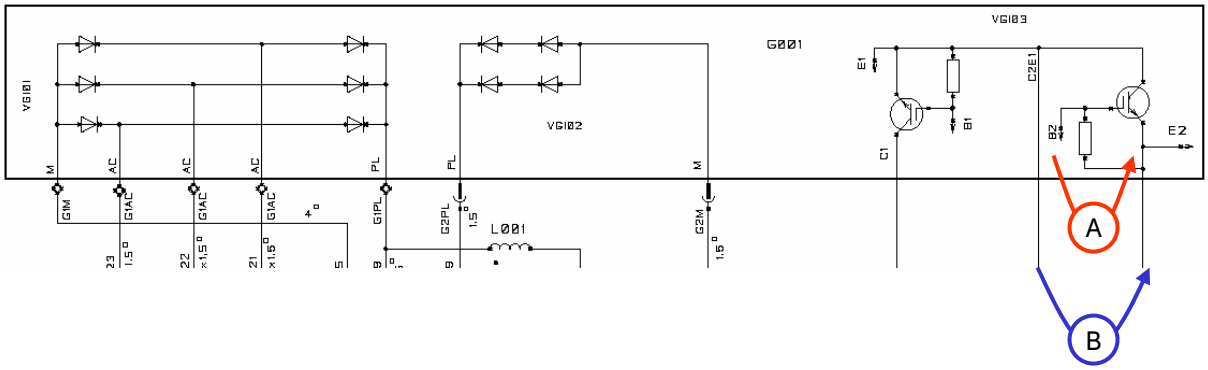
Kempomig- power sources power stage is a traditional half-bridge, where the DC-link´s voltage is halved by load capacitors C2 and C3. IGBT transistors work as power switches.

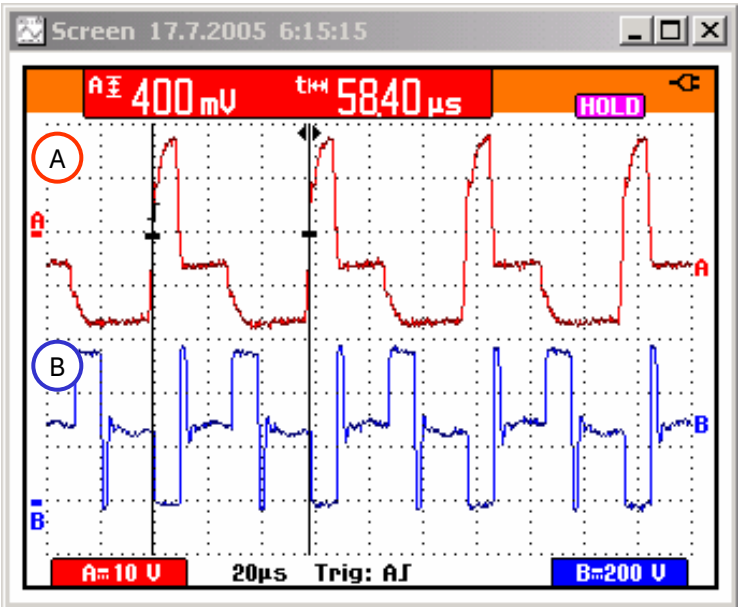
When both IGBTs are non-conductive, no power is transferred. When the upper IGBT (V2) is conductive, there is positive voltage in the main transformer´s (T1) primary, and when the lower IGBT (V3) is conductive there is negative voltage in the main transformer´s (T1) primary. Power is adjusted by changing the IGBT timings (PWM). Main transformer T1 secondary voltages are rectified with a full-waverectifier.





IGBT-module control

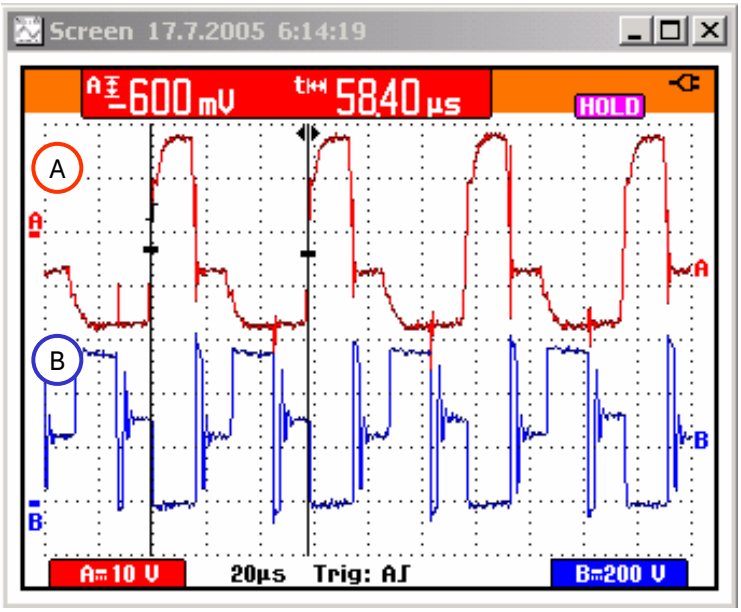




A = Gate pulse
(10 A / 20,4 V, MMA)

B = Voltage over the lower IGBT
(10 A / 20,4 V, MMA)

Inverter frequency approx. 17 kHz

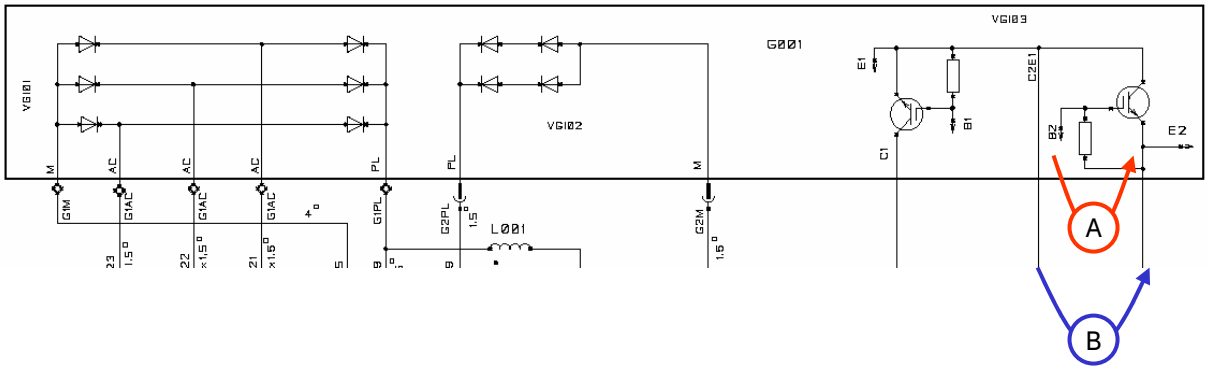


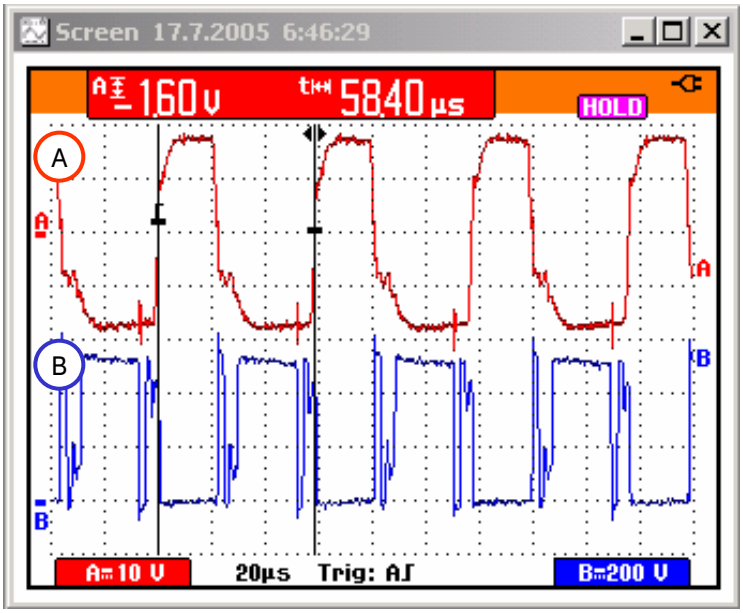
A = Gate pulse
(100 A / 24,0 V, MMA)

B = Voltage over the lower IGBT
(100 A / 24,0 V, MMA)

Inverter frequency approx. 17 kHz

IGBT-module control

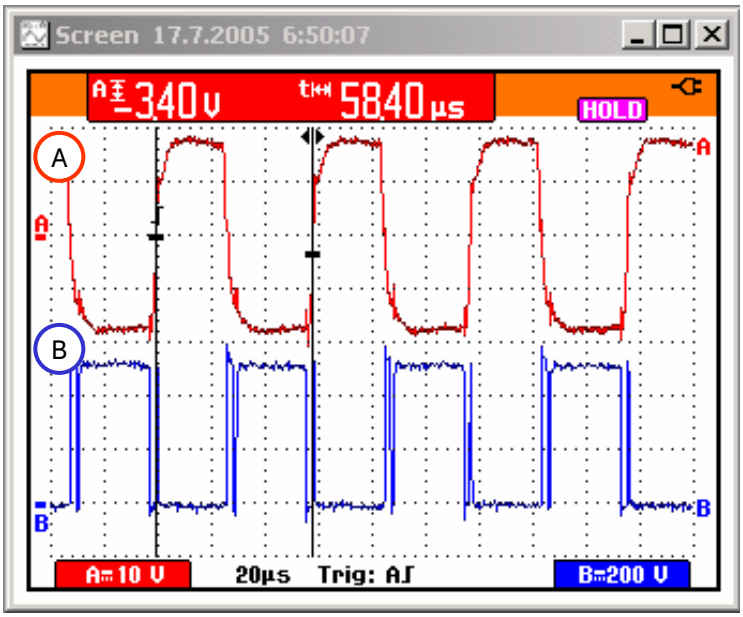




A = Gate pulse
(320 A / 32,8 V, MMA)

B = Voltage over the lower IGBT
(320 A / 32,8 V, MMA)

Inverter frequency approx. 17 kHz

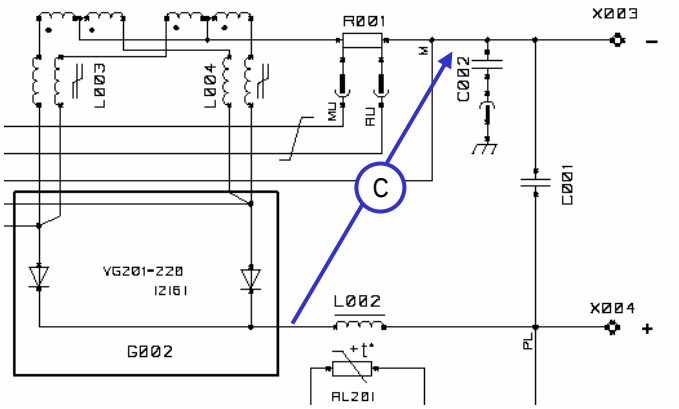


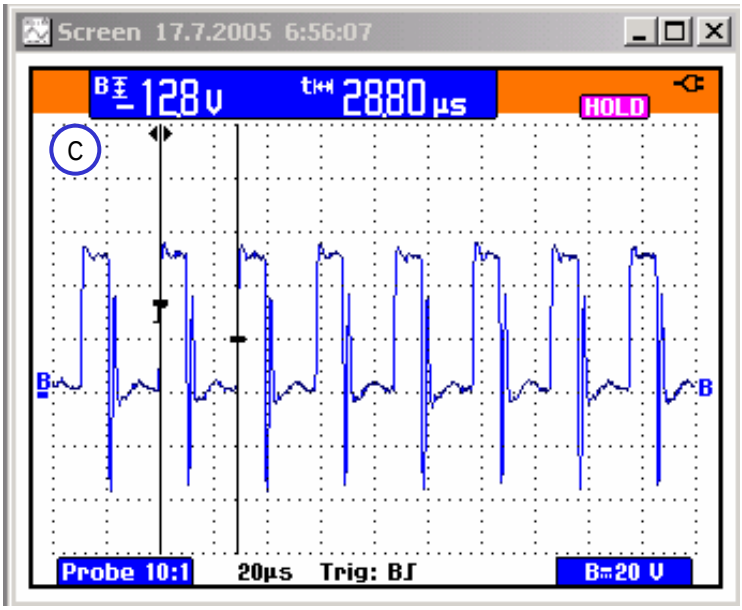
A = Gate pulse
(400 A / 36,0 V, MMA)

B = Voltage over the lower IGBT
(400 A / 36,0 V, MMA)

Inverter frequency approx. 17 kHz

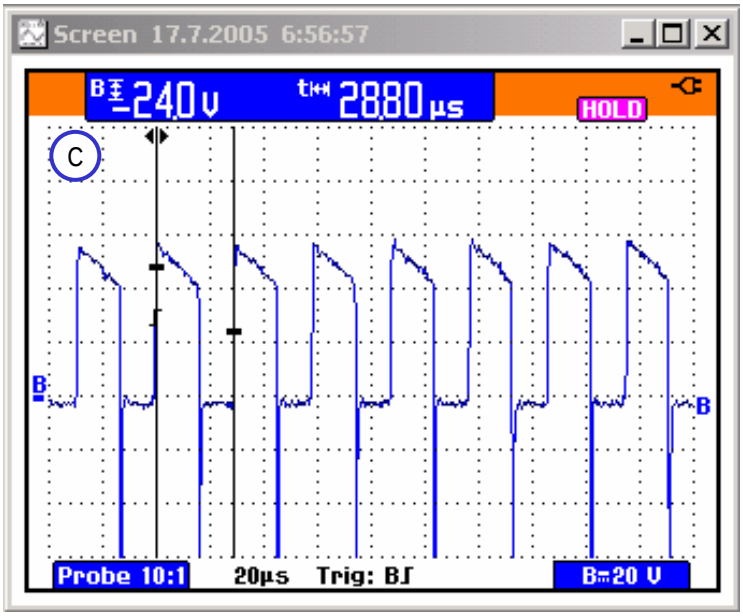
Voltage after secondary diodes





C = Voltage after the secondary diodes
(10 A / 20,4 V, MMA)

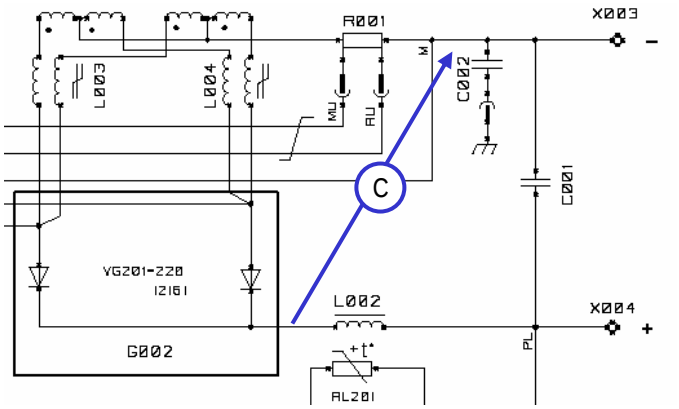
Frequency approx. 35 kHz

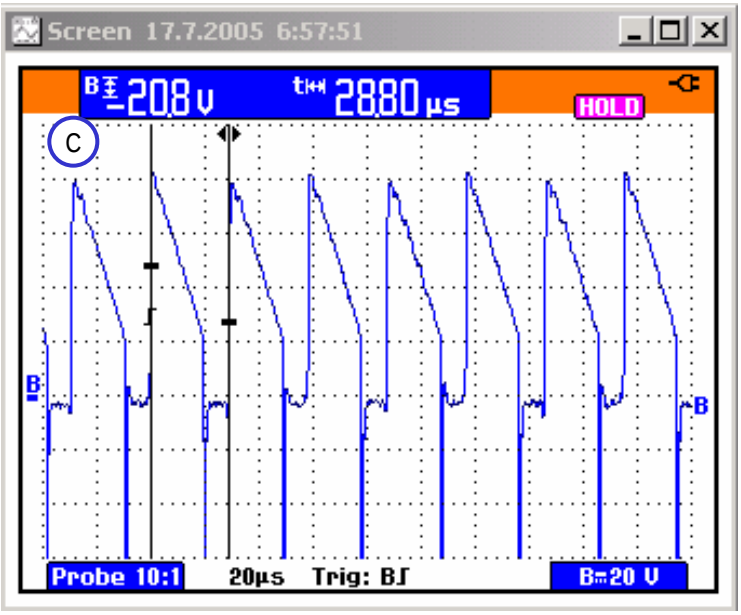


C = Voltage after the secondary diodes
(100 A / 24,0 V, MMA)

Frequency approx. 35 kHz

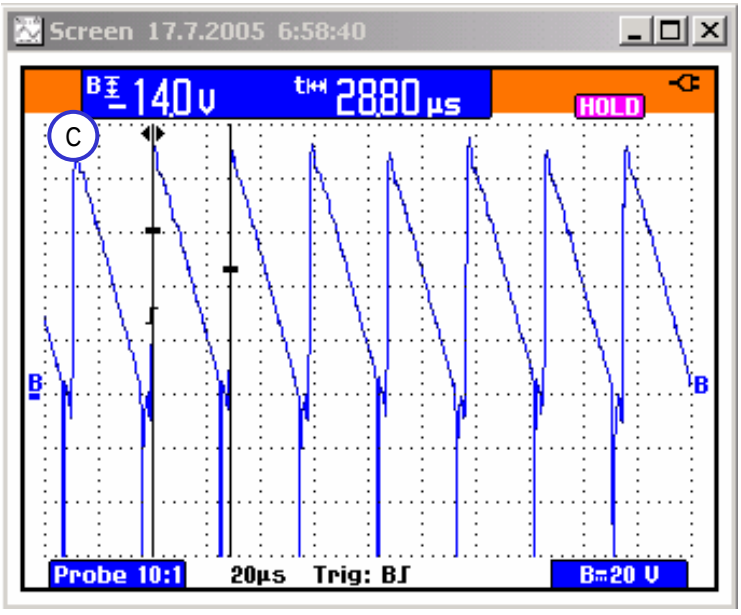
Voltage after secondary diodes





C = Voltage after secondary diodes
(320 A / 32,8 V, MMA)

Frequency approx. 35 kHz



C = Voltage after secondary diodes
(400 A / 36,0 V, MMA)

Frequency approx. 35 kHz

Troubleshooting

The device may be repaired only by a person legally authorized perform electric work!

Always check the device visually first, to find possible damages like loose wires, breaks or signs of overheating.

.

Also note the condition of the welding cables, welding gun and wire feed mechanism.

Troubleshooting diagram

DISTURBANCE	POSSIBLE CAUSE	REMEDY
The machine won´t start. WF-unit´s displays remain blank.	Net fuse has blown	Check the net fuses
	Faulty supply cable	Check the supply cable
	Faulty main switch	Check the main switch
	Faulty aux. transformer	Check the aux. transformer
	Faulty intermediate cable	Check the intermediate cable between power source and wf-unit
The fuses blow during machine startup.	A faulty primary side power semiconductor	Check the primary rectifier and IGBT-module condition
	A faulty main circuit card	Check the load capacitors. See, if there are marks of insulation damages on the main circuit card.
	A faulty aux. transformer	Check the aux. transformer
	A faulty secondary unit	Check the secondary diodes
The machine welds, but displays remain blank.	Faulty flat cable	Check flat cables & connectors between control card A001 and operating panel.
	Faulty operating panel	Replace the operating panel
Power source stays on MMA, even though MIG is selected by the panel.	Faulty flat cables	Check flat cables & connectors between control card A001 and operating panel.
	Faulty synergy card P002	Disconnect the flat cable from P002 synergy card. As a result of this, if the power source goes to MIG, then replace the P002.

DISTURBANCE	POSSIBLE CAUSE	REMEDY
Error code E08 is shown on the panel display	Faulty welding gun Faulty wf-unit control card A001	Check the welding gun condition Check the wf-unit´s zener diodes V27 and V28 (24 V/5 W) on control card A001. If these diodes get damaged, there is an insulation problem in the welding gun between welding circuit and start wires
The equipment welds ok on spray arc values, but on short- and globular-arc it is impossible to weld	Faulty intermediate cable	Check the intermediate cable between wf-unit and power source and see that the process selection works ok (I-line)
The power source doesn´t start the cooling unit	Faulty intermediate cable Faulty power source control card A001 Faulty power source control A002	Check the intermediate cable between wf-unit and power source and see that the process selection works ok (I-line) Check the signals on control card A001´s connector X7 If the signals on control card A001 connector X7 are ok, then replace the control card A002
The equipment welds poorly on short- and globular arc	Power source´s control card A001	See, if there is a resistor R188 mounted onto the control card A001. If one is found, remove it.
The arc is intermitted and overheat signal lamp is flashing at the same time	DC-link overvoltage	Measure the supply voltage. Overvoltage watch stops welding if supply voltage rises above 520 Vac. Check the rectifier unit VG102 wiring and if the unit is damaged, the DC-link voltage may momentarily rise above +900 V, which activates the watch circuit.
Wf-unit doesn´t control the power source	Faulty intermediate cable Faulty aux. transformer Faulty control card A001	Check the intermediate cable between power source and wf-unit Check the auxiliary transformer and make sure 18 Vac is taken to power source´s control card connectors X15/1 and X15/2 Check wf-unit control card A001

DISTURBANCE	POSSIBLE CAUSE	REMEDY
The power source can´t reach maximum output	Net fuse has blown	Check the net fuses
	A faulty supply cable	Check the supply cable
	A faulty main switch	Check the main switch
	A faulty primary rectifier	Check the primary rectifier. Measure the DC-link voltage during idling and under load (530…570 Vdc)
	A faulty control card A001	On the power source´s control card A001, check that the IGBT-module´s gate pulses are correct. Replace the control card if necessary.
	A faulty control card A001	On the power source´s control card A001, check that the set value is developed correctly (H-line; 0-10 Vdc). Replace if necessary.

Wire feed unit error codes

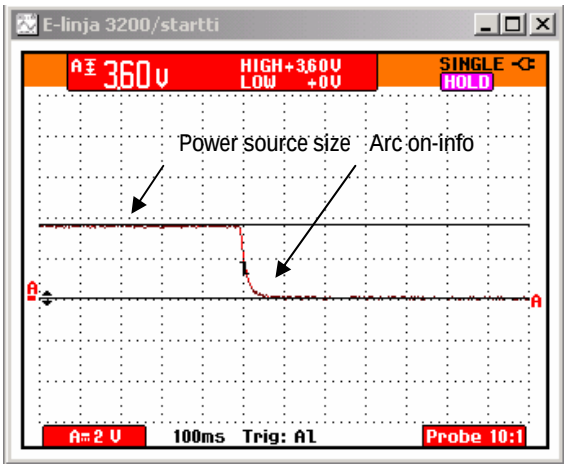
E02	Gun switch is being pressed, while MMA welding has been selected by the FEED panel
E08	Liquid cooled PMT-gun has overheated
E09	Wf-motor has been overloaded
E11	PMT-gun has been tried to use, though PMT-/RMT-functions have been disabled by jumper 5
E12	Shielding gas watch has interrupted welding (GG 400)

Signals between power source and wire feeder unit

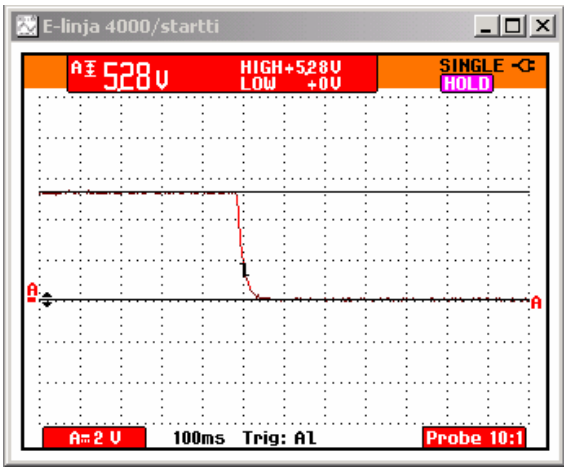
Signals in the control cable between the power source and the wire feeder unit:

Pin	Signal	Explanation
A	-	-
B	30 Vac	Supply voltage for wire feeder unit (fuse 6,3 A slow)
C	30 Vac	Supply voltage for wire feeder unit (fuse 6,3 A slow)
D	-	-
E	Power source size / Arc on	Power source size detection / Arc on-info to the wf-unit
F	0 V	GND
G	-	-
H	0 - 10 V	Set value information to the power source (current or voltage)
I	Process selection / MIG/MAG-dynamics	+ 10 V = MMA + 0,5 – 3,5 V = MIG/MAG-process and MIG/MAG-dynamics setting

Voltages in the E-line of control cable between the power source and the wire feeder:



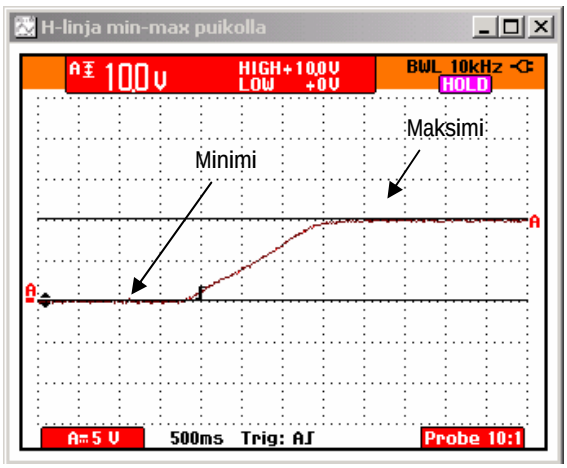
Kempomig 3200



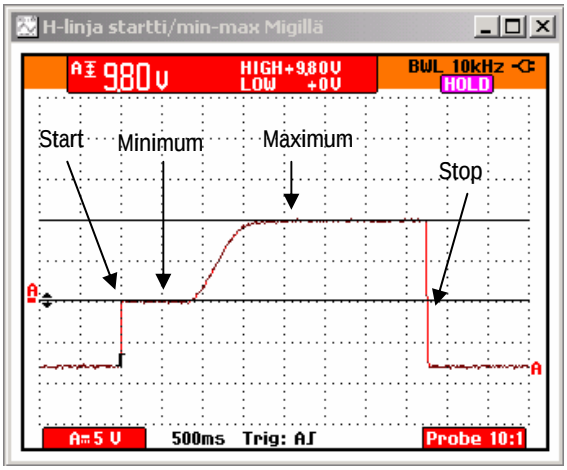
Kempomig 4000

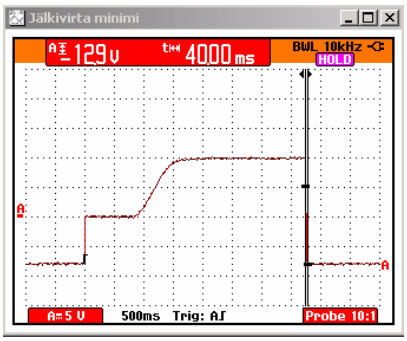
During startup the wire feeder detects the power source size, based on the voltage level at E-line. When the arc is ignited the power source pulls down the voltage in E-line, which gives an ar on-signal to the wire feeder. This arc on-signal can be used for different kinds of mechanization purposes.

Voltages in the H-line of the control cable between the power source and the wire feeder:

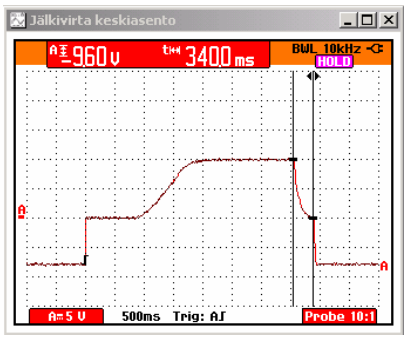


On MMA the wire feeder unit starts the power stage and develops an analog set value voltage of 0-10 V.

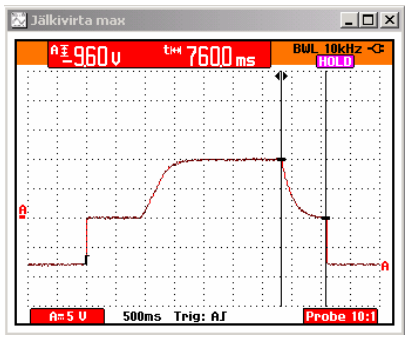




Post-current time minimum = 40 ms



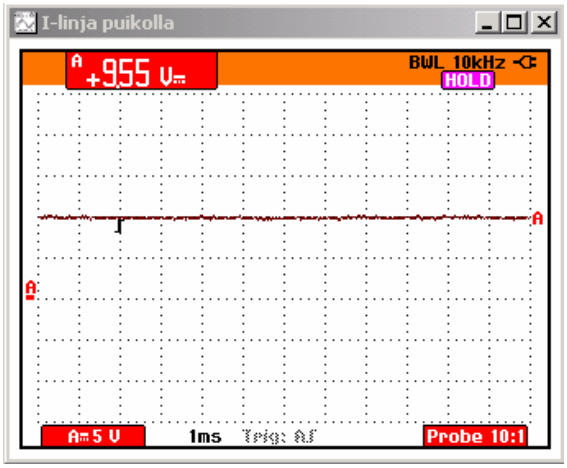
Post curren time medium = 340 ms



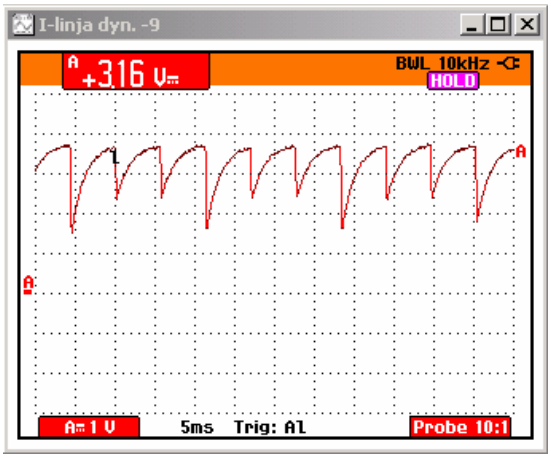
Post current time maximum = 760 ms

On MIG/MAG the wire feeder unit starts and stops the power stage accoding to the gun switch and develops the analog set value voltage (0-10 V) and post current time.

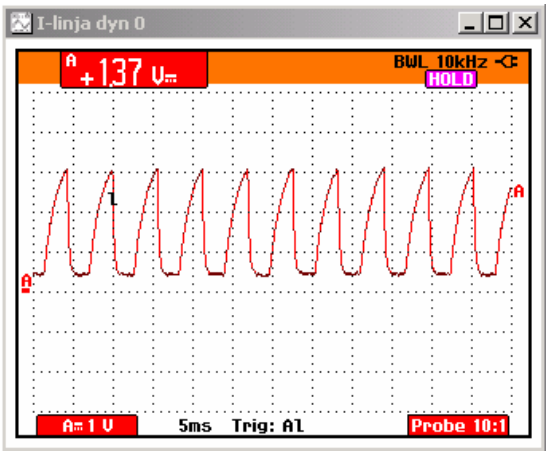
Voltages in the I-line of the control cable between the power source and the wire feeder:



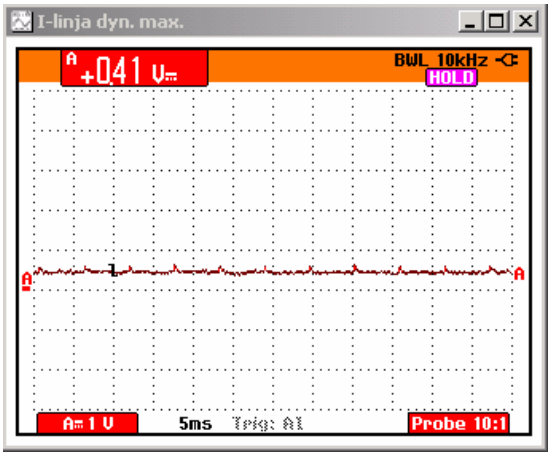
On MMA the voltage of I-line is approx. + 10 V



MIG/MAG dynamics - 9



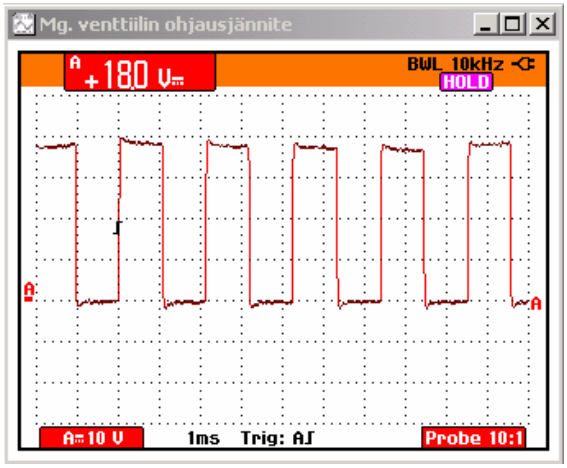
MIG/MAG dynamics 0



MIG/MAG dynamics + 9

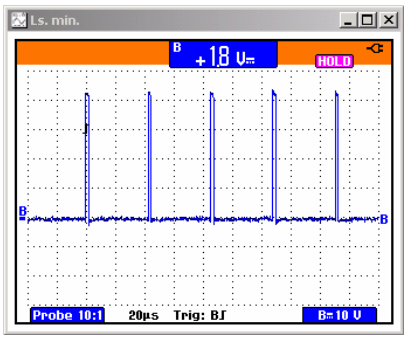
On MIG/MAG-process the voltage in I-line is approx. + 0,5 - 3,2 V, depending on the dynamics setting. Note, that when welding with 1-MIG the dynamics setting is optimized according to the filler material and gas-combination in use, so the adjustment range depends on the chosen 1-MIG program.

Solenoid valve control

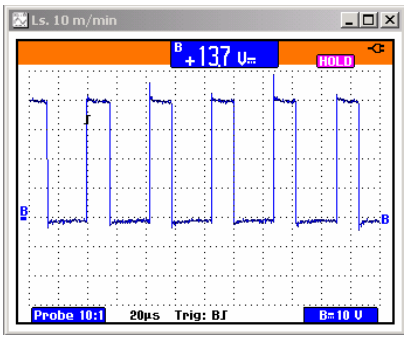


The wf-unit develops control voltage for the solenoid valve, by pulsing approx. + 40 V voltage with Pulse ratio of 50 %.

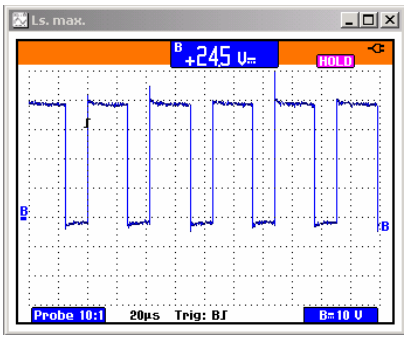
Wire feed motor control



Wire feed speed minimum



Wire feed speed 10 m/min

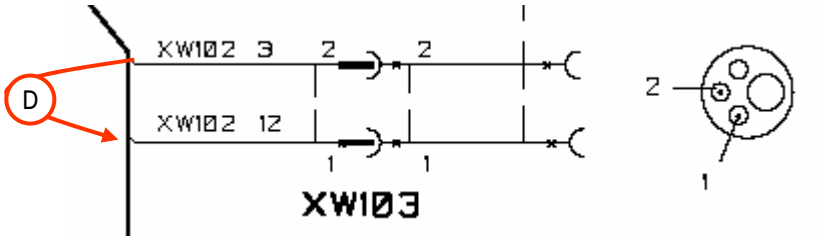


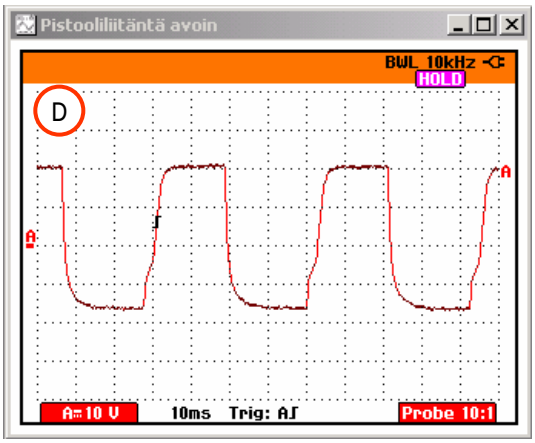
Wire feed speed maximum

The wf-unit controls the feed motor speed by PWM-principle.

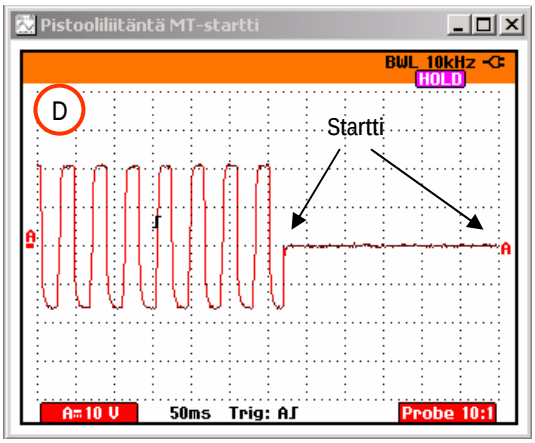
Welding gun connection

The voltage ”direction” changes every 20 ms in the gun control circuit. On the negative half cycle the gun switch and temperature watch (PMT W) states are read. On the positive half cycle the state of an RMT 10 guncontroller is read.

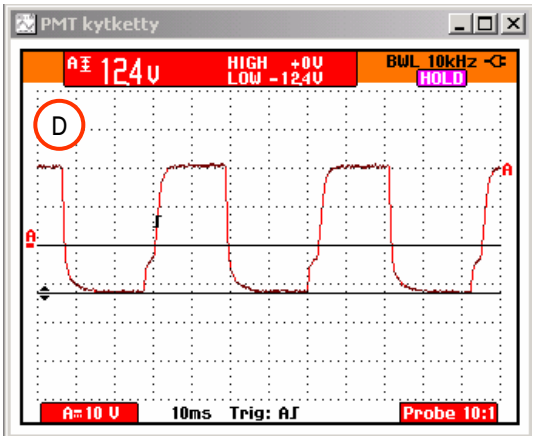




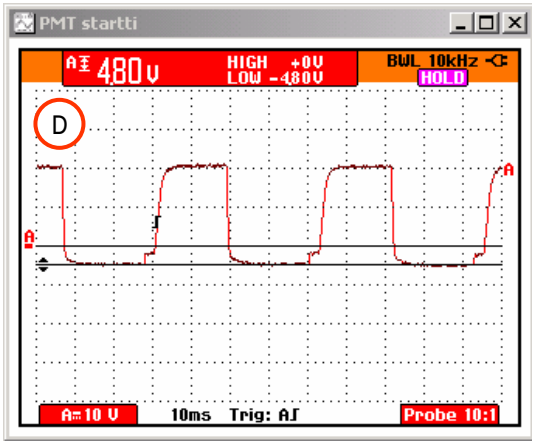
Gun connection open



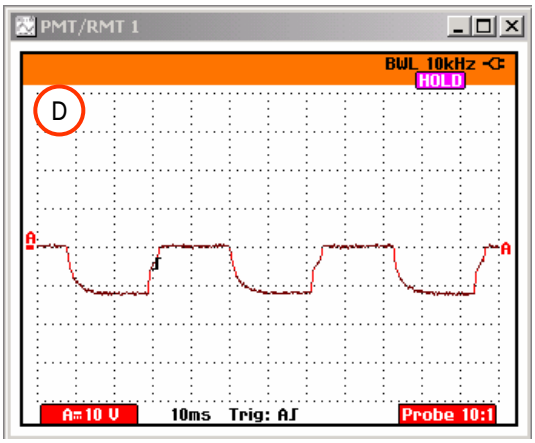
Gun start (MT-type guns)



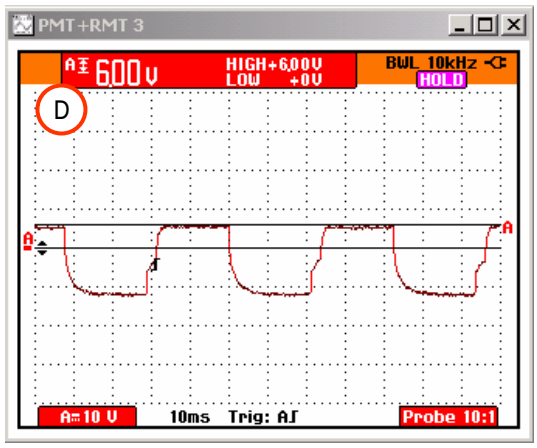
PMT-gun connected



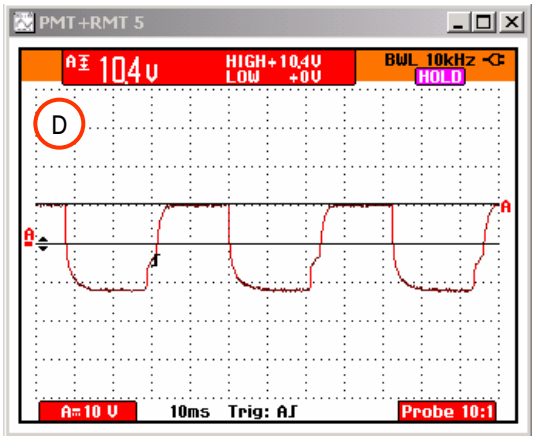
PMT-gun start



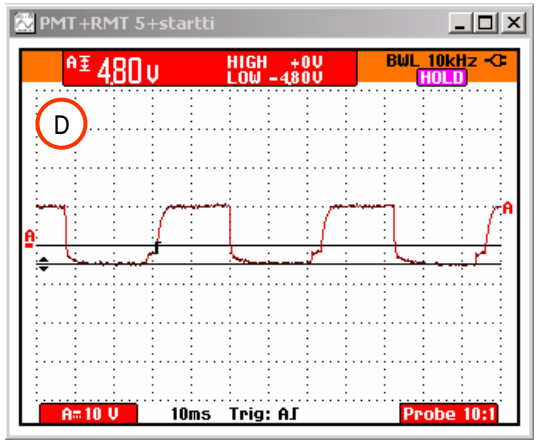
PMT-connected and RMT in position 1



PMT-connected and RMT in position 3



PMT-connected and RMT in position 5



PMT –gun start and RMT in position 5

Signals from Wf-unit´s connectors

Remote controller connector XW101

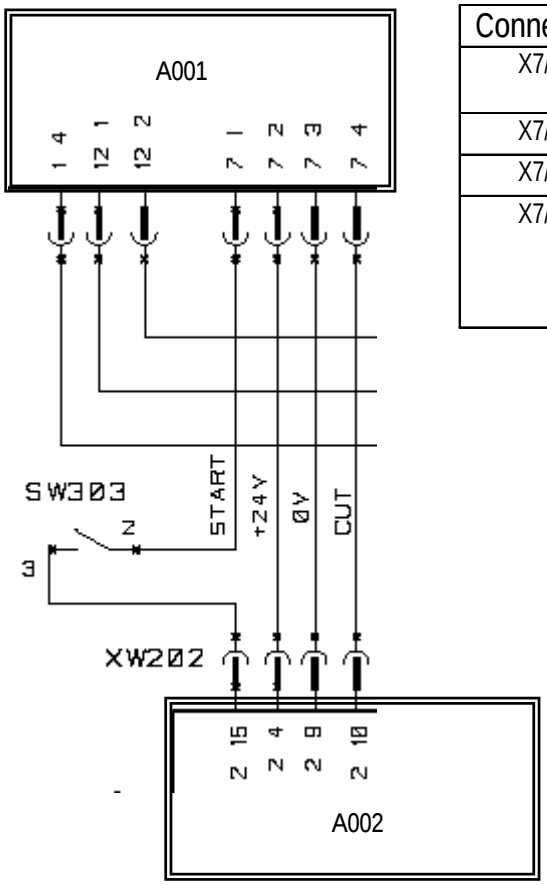
Pin	Signal	Explanation
A	-	-
B	30 Vac	Supply voltage (fuse 6,3 A slow)
C	30 Vac	Supply voltage (fuse 6,3 A slow)
D	-	-
E	+ 10 V	Remote controller voltage reference
F	0 V	GND
G	0 - 10 V	Wire feed speed set value
H	0 - 10 V	Set value to power source (current or voltage)
I	Process selection	+ 6 - 10 V = MMA 0 – 5 V or open = MIG/MAG-process

Motor gun connection XW101

Pin	Signal	Explanation
A	0 V	GND
B	+ 10 V	Motor gun adj. potentiometer voltage reference
C	0 - 10 V	Wire feed speed set value
D	+ M	Gun motor positive +
E	0 - 10 V	Voltage set value
F	Start 2	Start-switch connector 2
G	Start 1	Start-switch connector 1
H	- M	Gun motor negative -
I	-	-

Cooling unit control

The cooling unit is controlled on only on MIG process, while start is active. Cooling unit stops the power stage if a missing coolnat pressure is detected or the coolant has overheated.



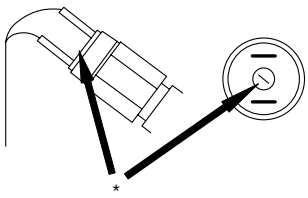
Connector	Signal
X7/1	Cooling unit start (in start the power source control card A001 pulls down the voltage on connector X7/1)
X7/2	Supply voltage to control card A002 electronics (+ 24 V)
X7/3	GND
X7/4	Stop, if coolant pressure is less than 1 bar or the coolant temperature rises above + 60° C, then the control card A002 pulls down the voltage on connector X7/4, which shuts the power source down.

Adjusting the cooling unit pressure watch limit

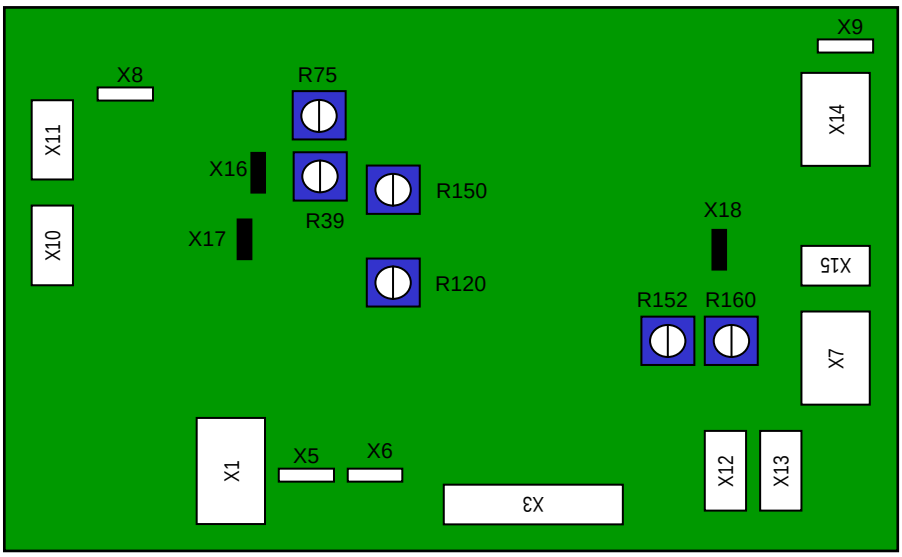
(Kempomig 3200W/4000W)

If the missing coolant pressure signal lamp (17) is lit, though coolant circulates normally, then The pressure watch limit can be adjusted as follows:

1. Run the pump by the test switch
2. Adjust the pressure switch adj. Screw counter-clockwise, until the warning lamp goes out.
3. Check the operation with a test weld



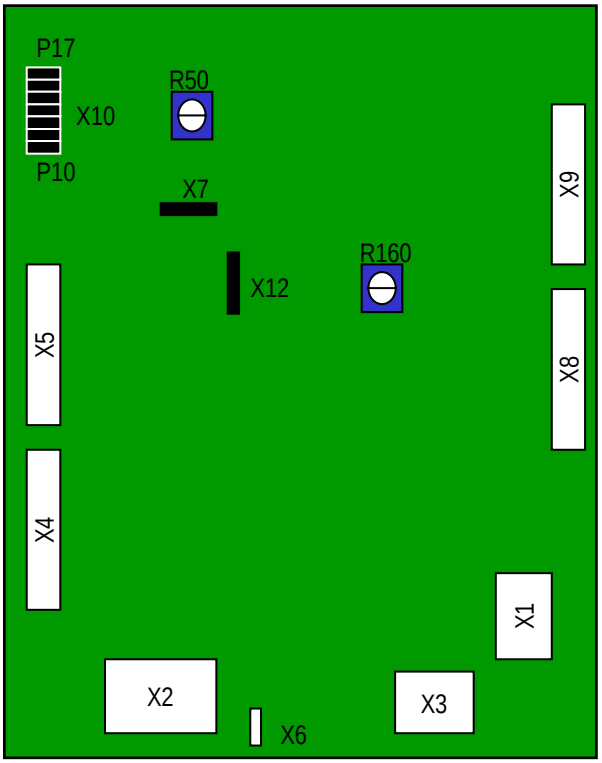
Power source control card A001 layout



R39 Current max.
R75 Inv. frequency
R120 Voltage max.
R150 Voltage min.
R152 Current min.
R160 MMA ignition pulse

X16 Supply voltage selection, 460 V
X17 Supply voltage selection, 400 V
X18 MMA characteristic curve for *testing* without a wire feeder unit

Wire feeder control card A001 layout

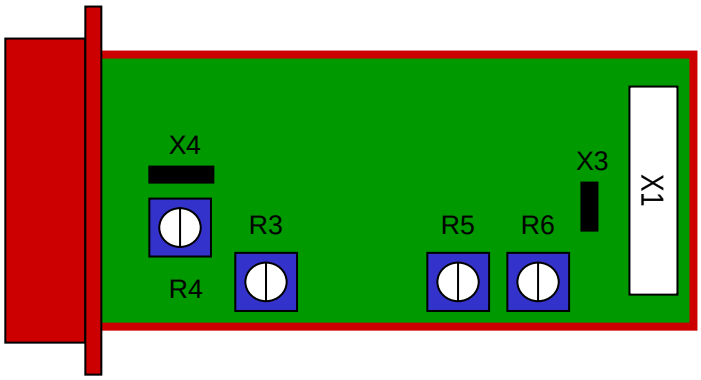


R50 Post gas time 0…2 s. (A3.0)
R160 Crater fill angle

X12 EPROM-circuit 256k/512k selection

X10	Function	Closed	Open
8			
7			
6			
5	PMT-/RMT-functions	Enabled	Disabled
4			
3	Creep start	Off	On
2	Pre gas	Off	On
1	Wire feed max.	18 m/min	25 m/min

MSD 1-meter unit layout



R3 Set current minimi (no function with Kempomig-power sources)
R4 Set current maximum (no function with Kempomig-power sources)
R5 Voltage display
R6 Current display

X3 (no function with Kempomig-power source)
X4 (no function with Kempomig-power sources)

Notes